



SHORT NOTE

Bill edge development as a reliable character for discriminating two age classes within juvenile Swallows *Hirundo rustica*

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The breeding populations of the Swallow *Hirundo rustica* show long-term declines in most European countries (BirdLife International 2004, Hagemeyer & Blair 1997, Tucker & Heath 1994). An international project, coordinated by EURING, is in progress to investigate the causes. Part of the work is studying annual reproduction and survival rates of adults and their young (Jenni 1998). The physical condition of Swallows just before autumn migration may be an important indicator of the probability that they will survive to the next breeding season. Within young Swallows, fitness could be age-dependent, with older individuals that fledge from early broods being more experienced in using environmental resources than juveniles from late broods. To compare fitness data not only between adults and juveniles but also between recently-fledged and older juvenile Swallows we looked for an externally-visible character to distinguish these two cohorts in the field. So far, no such criteria seem to have been described (Svensson 1992, Suter 1985, Cramp *et al* 1988).

Here we present data to demonstrate that scoring the stage of development of the bill edges is a useful method for that purpose. During the nestling period, the yellow gape and the whitish, swollen bill edges stimulate parental feeding and are therefore important for nestling growth and survival. After fledging and especially after juveniles have reached their independence, bill edges regress as their function becomes irrelevant. Up to now, it is unclear to what extent and at which age this occurs.

Within the Swiss Swallow project, we used, over a period of six years (1998-2003), data from retrapped young Swallows ringed as nestlings of known age to quantify the process of bill edge regression. Nestling age was estimated with an accuracy of ± 1 day by using observations during weekly visits to the nests as well as the key for ageing nestlings in Jenni (1998). Birds were

retrapped by 35 ringers, either at the nests where the fledged young spent the night, or at common roosts in reedbeds. The birds were retrapped between the last 10 days of June and the end of September, when most of the common roosts in Switzerland dispersed. All birds were assigned to one of three classes on the basis of colour and appearance of the bill edges. The classes and representative examples are given in Fig 1. If more than one member of the same brood was caught at a nest, only one selected at random was included in the analysis.

We found that birds showing thick, pale yellow bill edges (stage 2) were at most 59 days old with highest frequencies just after fledging which occurs normally at the age of 21 days. For stage 2 birds older than 30 days ($n = 68$, Fig 2) – younger individuals rarely spend the night at common roosts – the median age was 39, and the 90th percentile 46 days. On the other hand, Swallows with completely blackish and narrow bill edges (stage 0, $n = 68$) were all older than 43 days (median = 69.5, 10th percentile = 51 days), the oldest birds reaching 103, 105 and 115 days. To discriminate the two groups quantitatively we used multiple logistic regression with age and length of the third primary as predictors. Although significant, the length of the third primary had little effect on the probability distribution, whereas age resulted in a sharp discrimination between the two groups ($-2\log(\text{Likelihood}) = 49.13$, $\chi^2 = 133.74$, d.f. = 2, $P < 0.001$). From this analysis, an age limit of 49.8 days optimally separated the frequency distributions of stages 0 and 2 on the age axis. Birds showing intermediate scores (stage 1, $n = 52$) were found from the age of 33 days onwards and also occurred among adults.

We conclude that scoring the bill edge development of young Swallows according to the described stages allows us to discriminate two age classes, birds with completely narrow, blackish bill edges (stage 0) being distinctly older than those showing swollen and pale yellow ones (stage 2). The age limit between these two classes is about 50 days, an age equivalent to approximately four weeks after fledging. Both classes overlapped little with regard to age: in our case, 92.6%

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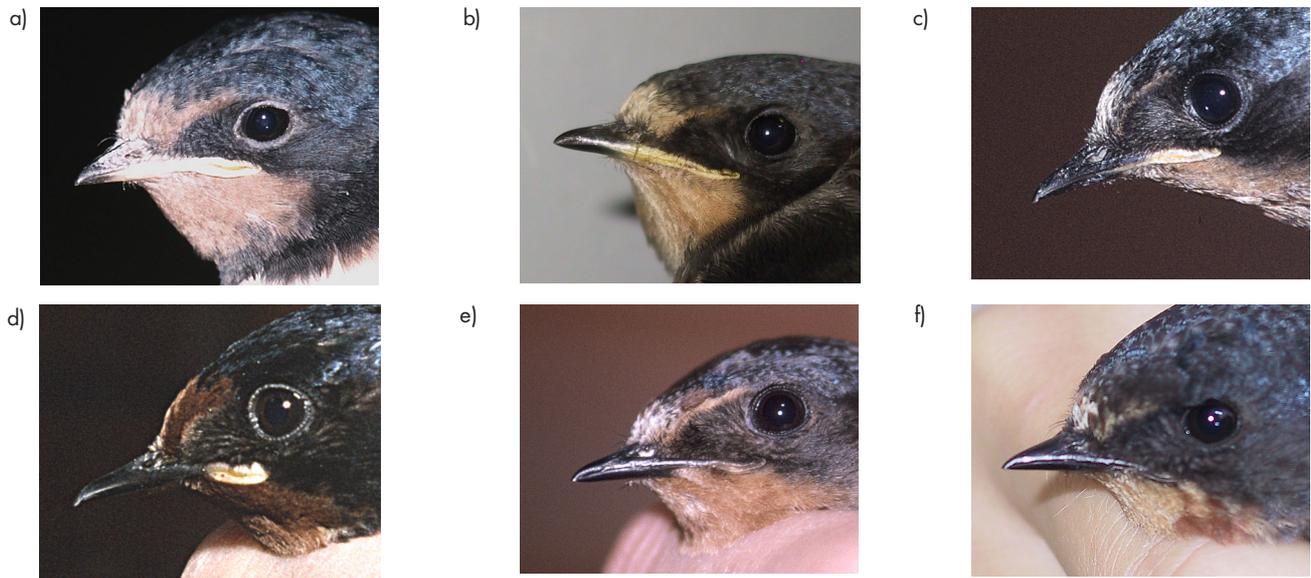


Figure 1. Photographs (by J. von Hirschheydt) of bill edge stages 2, 1 and 0.

- a) Stage 2 in a 18 day old Swallow nestling: apart from the bill tip, edges are whitish and strongly swollen.
 b) Typical stage 2 in a fledged young Swallow: on the proximal two thirds of the bill edges are distinctly yellow and swollen. To be assigned to this stage, more than half of the bill length should show these characters.
 c) Stage 1 in a young Swallow: whitish and swollen bill edges only on the proximal third of the bill.
 d) Rare case of stage 1 in an adult female with extremely well developed bill edges: strongly swollen and whitish around the base, but completely narrow and blackish over the other parts of the bill.
 e) Late stage 1 at the limit to stage 0 in a young Swallow: only trace of yellowish coloration around the base, edges hardly swollen.
 f) Stage 0 in a young Swallow: completely narrow and blackish bill edges.

This figure can be seen in colour at : http://blx1.bto.org/pdf/ringmigration/22_4/vonhirschheydt.pdf

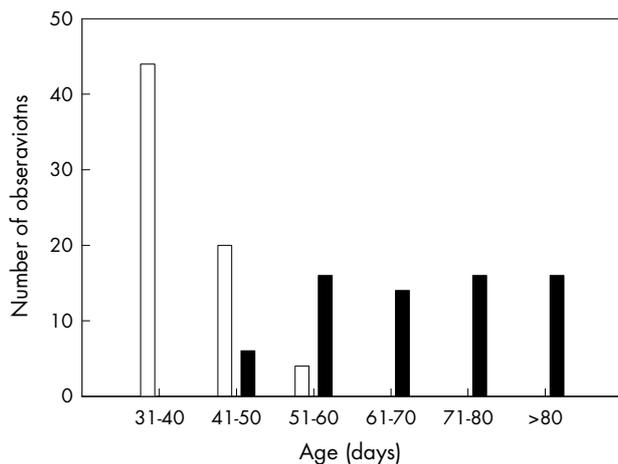


Figure 2. Frequencies of young Swallows showing thick, whitish (stage 2, n=68, open bars) or narrow, blackish (stage 0, n=68, filled bars) bill edges according to age.

of the birds of known age and assigned to the scores 2 and 0 respectively by appearance of their bill edges belonged to the corresponding age classes. However, age classification of birds at intermediate stages is not possible, since the range of ages overlaps broadly with the stages 2 and 0. As the relevant stages 2 and 0 are easily distinguishable in the field, the method should be robust against individual bias of different ringers. Our six years of data covered the period from fledging of the first nestlings in June until dispersal of most of the pre-migration roosts at the end of September. Accordingly, the age of juveniles of stage 0 ranged from 43 to 115 days. As the phenology of the Swallow is rather similar in great parts of Western, Central and Eastern Europe (Suter 1985), we expect that the method can be used in all these zones.

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